WHAT IS CLAIMED IS:

1. A Multiple Input Multiple Output (MIMO) - Orthogonal Frequency Division Multiplexing (OFDM) system comprising a transmitter with L transmit antennas, a receiver with M receive antennas, and an uplink feedback device for providing information of the receiver to the transmitter, wherein the transmitter comprises:

a serial/parallel converter for converting continuously inputted symbols of a number of subcarriers to K parallel signals;

a signal reproducer for reproducing K parallel signals by the number L of transmit antennas;

an eigenmode generator for generating eigenbeams of the reproduced signals outputted from the signal reproducer at each subcarrier, on the basis of N_f eigenbeam forming vectors which are fed back long-term and information of a best eigenbeam forming vector at each subcarrier which is fed back short-term, through the feedback device; and

a plurality of inverse Fourier converters for receiving the signals outputted from the eigenmode generator and generating an OFDM symbol.

2. The MIMO-OFDM system of claim 1, wherein the eigenmode generator updates at least one eigenbeam forming vector stored previously, whenever information of at least one same eigenbeam forming vector for subcarriers is fed back through the uplink feedback device.

3. The MIMO-OFDM system of claim 1, wherein the receiver comprises an eigenbeam calculator for estimating a channel to the signal transferred from the transmitter and calculating an instantaneous covariance and a spatial covariance matrix, and N_f dominant eigenvectors.

5

4. The MIMO-OFDM system of claim 3, wherein the eigenbeam calculator calculates the instantaneous channel covariance at each subcarrier for each symbol, and calculates the spatial covariance matrix at only one subcarrier for each symbol.

10

5. The MIMO-OFDM system of claim 3, wherein the eigenbeam calculator calculates the spatial covariance matrix in a two dimension domain which uses both a frequency domain and a time domain of subcarriers.

15

6. The MIMO-OFDM system of claim 4, wherein the eigenbeam calculator obtains an eigenvalue of the instantaneous channel covariance and provides the eigenvalue to the uplink feedback device within a coherent time, and obtains at least one best eigenbeam forming vector from the spatial covariance matrix and provides the at least one best eigenbeam forming vector to the uplink feedback device.

20

7. The MIMO-OFDM system of claim 6, wherein the uplink feedback device performs long-term feedback of the eigenbeam forming vector

30

information transferred from the eigenbeam calculator to the eigenmode generator, and performs short-term feedback of the number of the dominant eigenbeam forming vector transferred from the eigenbeam calculator to the eigenmode generator.

8. A MIMO-OFDM system comprising:

a serial/parallel converter for converting continuously inputted symbols of the number of subcarriers to K parallel signals;

a signal reproducer for reproducing K parallel signals outputted from the serial/parallel converter by the number of transmit antennas;

an eigenbeam calculator for calculating an instantaneous channel covariance and a spatial covariance matrix by using the uplink channel information, providing N_f dominant eigenbeam forming vectors from the spatial covariance matrix, and providing the eigenvalue of the instantaneous channel covariance;

an eigenmode selector for selecting an eigenmode of which the eigenvalue of the instantaneous channel covariance is maximum among N_f, whenever N_f eigenbeam forming vectors are inputted from the eigenbeam calculator and the instantaneous channel covariance is updated; and

a plurality of inverse Fourier converter for receiving the signals outputted from the eigenmode selector, and generating an OFDM symbol.

9. The MIMO-OFDM system of claim 8, wherein the eigenbeam

calculator calculates the instantaneous channel covariance at each subcarrier for each symbol, and calculates the spatial covariance matrix at only one subcarrier for each symbol or calculates the instantaneous channel covariance in a two dimensional domain which uses both a frequency domain and a time domain of subcarriers.

10. The MIMO-OFDM system of claim 8, wherein the eigenbeam calculator calculates the spatial covariance matrix in a two dimensional domain which uses both a frequency domain and a time domain of subcarriers.

11. The MIMO-OFDM system of claim 9, wherein the eigenbeam calculator obtains an eigenvalue of the instantaneous channel covariance and provides the eigenvalue to the eigenmode selector, and obtains at least one dominant eigenbeam forming vector from the spatial covariance matrix and provides the at least one dominant eigenbeam forming vector to the eigenmode selector.

12. A MIMO-OFDM system comprising a transmitter with L transmit antennas, a receiver with M receive antennas, and an uplink feedback device for providing information of the receiver to the transmitter, wherein the transmitter comprises:

a serial/parallel converter for converting continuously inputted symbols of a

number of subcarriers to K parallel signals;

a signal reproducer for reproducing K parallel signals outputted from the serial/parallel converter by the number of transmit antennas;

an eigenmode generator for generating one eigenbeam for each group of subcarriers, on the basis of long-term feedback information corresponding to N_f eigenbeam forming vectors and short-term feedback information corresponding to a group of subcarriers which are provided through the feedback device; and

a plurality of inverse Fourier converters for receiving the signals outputted from the eigenmode generator and generating an OFDM symbol.

13. The MIMO-OFDM system of claim 12, wherein the eigenmode generator generates the same eigenbeam corresponding to each group of subcarriers by dividing K parallel signals inputted from the signal reproducer into K_f groups of $\overline{K}$ subcarriers, and multiplies each group of subcarriers by Kf weight vectors.

14. The MIMO-OFDM system of claim 13, wherein the eigenmode generator comprises a weight vector determiner for generating Kf weight vectors on the basis of the long-term feedback information and the short-term feedback information.

15. The MIMO-OFDM system of claim 14, wherein the weight vector

determiner comprises:

an eigenbeam update device for updating N_f eigenbeam vectors which subcarriers own in common, whenever the long-term feedback information is provided through the uplink feedback device; and

Kf eigenmode determiners for receiving N_f eigenbeam vectors and the short-term feedback information, and selecting one eigenbeam vector among N_f eigenbeam vectors and outputting the eigenbeam vector as the weight vector.

16. The MIMO-OFDM system of claim 12, wherein the receiver comprises an eigenbeam calculator for estimating a channel to the signals outputted from the transmitter and providing an instantaneous covariance and a spatial covariance matrix, and N_f dominant eigenvectors.

17. The MIMO-OFDM system of claim 16, wherein the eigenbeam calculator comprises:

M channel estimators for estimating a channel of K signals transferred from the transmitter;

Kf instantaneous power measuring devices for measuring each instantaneous power to a predetermined signal among K signals outputted from the M channel estimators;

an eigenvector calculator for obtaining a channel spatial covariance

matrix which is the same for subcarriers, for the signals outputted from the

channel estimators, and calculating N_f dominant eigenvectors; and

an eigenvector selectors for selecting one eigenvector with

maximum instantaneous power from among N_f dominant eigenvectors by

using the N_f dominant eigenvectors outputted from the eigenvector

calculator and the instantaneous power inputted from the corresponding

instantaneous power measuring device, and providing the eigenvector with

maximum instantaneous power for the short-term feedback information.

18. The MIMO-OFDM system of claim 17, wherein the eigenbeam

calculator obtains the long-term feedback information by quantizing

amplitude and phase of the dominant eigenvector of the channel spatial

covariance matrix calculated by the eigenvector calculator.

19. The MIMO-OFDM system of claim 18, wherein the eigenbeam

calculator transfers the long-term feedback information to the uplink

feedback device within a coherent time, and transfers the short-term

feedback information to the uplink feedback device.

20. A beam forming method for a MIMO-OFDM system comprising a

transmitter with L transmit antennas and a receiver with M receive antennas,

comprising:

(a) converting continuously inputted symbols of a number of

subcarriers to K parallel signals;

(b) reproducing K parallel signals by the number of transmit antennas; and

(c) generating one eigenbeam for each group of subcarriers, on the basis of the long-term feedback information corresponding to N_f eigenbeam forming vectors and the short-term feedback information corresponding to the group of subcarriers.

21. The beam forming method of claim 20, wherein the step (c) comprises:

dividing K reproduced parallel signals into K_f groups of $\bar{\bar{K}}$ subcarriers; and

generating the same eigenbeam corresponding to each group of subcarriers by multiplying the K_f group of subcarriers by Kf weight vectors.